

The Comparison of the Online and Face-to-Face Assessments of Physical Functions in Healthy Adults

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Received: 14 May 2023
Accepted: 11 July 2023

ABSTRACT

Purpose: This study aims to investigate whether online assessments can be used as an alternative way to face-to-face assessments.

Method: The study included 20 volunteer healthy adults (F/M: 14/6; Age: 59.1 ± 8.02 years-old) without any neurological problems and scored 24 or higher in the Mini-Mental State Examination Test. All assessments (The Timed Up and Go Test (TUG), Berg Balance Scale (BBS), Five Times Sit to Stand Test (FTSTS), Arm Curl Test (ACT) and Toe Touch Tests (TTT)) were performed both online and face-to-face. Google Meet or Zoom Meetings platforms were used for online assessments. Differences between online and face-to-face groups were determined by the Wilcoxon test.

Results: In the study, there was no statistically significant differences between the online and face-to-face assessments of the TUG ($p=0.057$), BBS ($p=0.546$) and TTT ($p=0.438$). However, it was significant differences the online FTSTS ($p=0.028$) and ACT ($p=0.002$) tests with compared to face-to-face evaluation. The current study has shown that can be performed to adults of the assessments of TUG, BBS and TTT tests on the supervised online platform.

Keywords: Online assessments, Face-to-Face Assessments, Physiotherapy, Healthy Adults, Physical Functions

Sağlıklı Yetişkinlerde Fiziksel Fonksiyonların Online ve Yüz Yüze Değerlendirme ile Karşılaştırılması

ÖZET

Amaç: Bu çalışma, çevrimiçi değerlendirmelerin yüz yüze değerlendirmelere alternatif olarak kullanılıp kullanılamayacağını araştırmayı amaçlamaktadır.

Yöntem: Çalışmaya herhangi bir nörolojik sorunu olmayan ve Mini-Mental Durum Muayene Testinden 24 ve üzeri puan alan 20 gönüllü sağlıklı yetişkin (K/E: 14/6; Yaş: 59,1 ± 8,02) dahil edildi. Tüm değerlendirmeler (Zamanlı Kalk Yürü Testi; ZKY, Berg Denge Ölçeği; BDÖ, Beş Defa Oturup Kalkma Testi; BDOKT, Ağırlık Kaldırma Testi; AKT ve Parmak Ucuna Dokunma Testi; PUDT) hem çevrimiçi hem de yüz yüze yapıldı. Çevrimiçi değerlendirme için Google Meet veya Zoom Meetings platformları kullanıldı. Çevrimiçi ve yüz yüze gruplar arasındaki farkları Wilcoxon testi ile tespit edildi.

Bulgular: Araştırmada, ZKY ($p=0.057$), BDÖ ($p=0.546$) ve PUDT ($p=0.438$) online ve yüz yüze uygulamalarının arasında istatistiksel olarak önemli bir fark olmadığı ancak BKOK ($p=0.028$) ve AKT ($p=0.002$) testlerinde önemli bir fark olduğu sonucuna ulaşıldı. Mevcut çalışma, ZKY, BDÖ ve PUDT testlerinin değerlendirmelerinin denetimli çevrimiçi platformda yetişkinlere uygulanabileceğini göstermiştir.

Anahtar Kelimeler: Online Değerlendirme, Yüz yüze Değerlendirme, Fizyoterapi, Sağlıklı Yetişkinler, Fiziksel Fonksiyonlar

In December 2019, a new virus called Coronavirus-2019 (COVID-19), which affects the acute respiratory tract, emerged in China (1). In this pandemic, governments have decided to quarantine to control and spread of disease. The quarantine decision restricted patients' access to health systems, and as a result, tele-rehabilitation began to come to the fore. Actually, tele-rehabilitation systems were popular due to the development and widespread of technology use since 1998 (2). During the quarantine period, physical therapy interventions were applied with different tele-rehabilitation tools. Visual-based video-conferencing system is the most appropriate way to reach patients when the patients cannot reach the conventional rehabilitation system (3,4). In addition, tele-rehabilitation allows therapists supervise to online exercise therapy and follow-up of varied patient groups (5). A systematic review conducted in 2021 included 53 systematic reviews which are assessed tele-rehabilitation practices during the quarantine period. As a result, it was stated that tele-rehabilitation applications can be compared with face-to-face applications and even better results can be obtained (6). Although the general opinion in the literature is that tele-rehabilitation systems are as effective as face-to-face applications, it is also stated that it is appropriate to include a hybrid approach, that is, face-to-face and remote training program (7). Due to the pandemic, living conditions, and ease of access to healthcare systems, online evaluation procedures may be a facilitative method of treatment and follow-up for both patients and health professionals (4,8).

An important question that comes to mind was; Could physical evaluations of patients be performed remotely in front of the screen? The first studies on the evaluation remote of patients came to the fore in the 1990s. In one of these studies, the standard neurological assessment was examined using an interactive video link by a specialist doctor and conventionally face-to-face by an experienced doctor. The researchers explained that the results of the tele-health examination were as good as a conventional neurologic examination and the possibility of neurological assessments could be used in tele-medicine (9). Even recent days, common tele-rehabilitation assessments have started doing with a computer or sensors or mobile app that has a price (10-12). When we peruse at the studies on the functional evaluations performed by physiotherapists using tele-rehabilitation systems one systematic review stands out. The systematic review tested the gold standard face-to-face evaluation of physiotherapy evaluation components and the application of tele-rehabilitation technology. As a result, they stated that tele-rehabilitation systems may be a potential platform

for several physiotherapy evaluation components (observation, gait analysis, posture, muscle strength, and neuromechanical tests) (10). Researchers performed a standardized remote tele-assessment protocol for patients with Multiple Sclerosis (MS). In this protocol; Timed Up and Go, Berg Balance Test, Five Times Sit to Stand, Hand-Grip Strength (using hand dynamometer), and self-report assessment scales were used but the validity and reliability of the specific tele-assessment procedures have not yet been tested (13). Although, there are studies on tele-rehabilitation, more studies are needed on the assessment of physical functions.

The older adult group either benefit from tele-rehabilitation practices and have the most problems in using technology. Benefiting from the blessings of technology for healthy adults provides very important opportunities for therapists and patients today. In order to apply visual-based video-conferencing treatments to adults, it is vital that therapists know how to make functional assessments and which assessment scales they can safely use. Therefore, our study aimed to compare face-to-face and video conferencing assessments with the Timed Up and Go (TUG), Berg Balance Scale (BBS), Five Times Sit-to-Stand (FTSTS), Arm Curl Test (ACT) and Toe Touch Tests (TTT) in healthy adults.

MATERIAL AND METHOD

Participants

The participants of study consisted of 20 volunteer healthy adults (F/M: 14/6; Age: 59.1 ± 8.02 years-old). Before the evaluation, all participants were informed about the research and the purpose of the study. After their willingness to participate, they were obtained written consent. The Yeditepe University Non-Interventional Clinical Research Ethics Committee approved the study (E.83321821-805.02.03-64, 19 October 2022).

The sample size of the study was calculated as 20 by the GPower program, type 1 error $\alpha = 0,1$, Power $(1 - \beta) = 0.9$ and effect size value was calculated 0.8 for the Wilcoxon test. This study was carried out 20 volunteer healthy adults who lives in Istanbul Beylikdüzü between October-December 2022.

Mental status of the participants was determined by Mini-Mental State (MMSE) and also a possible risk of falling was determined by the Falls Efficiency Scale-1 (FES-1) (14-16). The willing participants who had MMSE score 24 and higher, and the Falls Efficiency Scale-1 between 16 and

64, and also knew how to use a tablet or computer were included in the study. Persons who had a neurological disorder or **musculoskeletal system problems such as orthopedic problems and also persons were not willing to participate were excluded from the study. None of the participants had rheumatological problems.**

Assessment

Assessment Procedure

Google Meet and Zoom meeting platforms used for video-conferencing were chosen by participants due to their preferences of comfort. For the online assessment, the screen was adjusted so that the researcher could see the participant's entire body. All assessments were done at the participant's houses on the same day. A 45-second coffee break was taken between face-to-face and online assessments. The evaluation started with an online procedure to prevent the learning of tests and testing procedures by participants.

- The researcher explained the testing instructions to the participants.
- The participants were applied either online and face-to-face assessments: Upper extremity strength; ACT, Lower extremity strength; TUG and FTSTS, Balance assessment; BBS, Flexibility; TTT.
- All scales used in the study were chosen from reliable and valid versions of the Turkish scales.
- Face-to-face and online assessments were performed in accordance with the testing procedures in the literature.
- A scheduled time for the evaluation day was offered to the participants.
- The participant prepared the necessary equipment before the test.
- On the day of the evaluation, participants were invited to bring a family member with them.
- The screen was altered for each test since the therapist and the participant needed to be able to see one another clearly.
- The participant was asked to conduct the test after the therapist demonstrated how it was done for all tests.

Upper Extremity Strength Assessment

Arm Curl Test (ACT)

Upper extremity flexor muscle strength and endurance evaluate with the ACT. This test is one of the testing protocols of the Senior's Fitness Test (17). The test aimed to complete as many curls as possible in 30 seconds. In the test, 2 kg dumbbells are used for women and 4 kg dumbbells are used for men for the curls of the dominant arm (18). In this study, white beans, rice or chickpea were used as a weight.

Online:

- The screen was adjusted.
- Therapist demonstrated the test.
- The weights that were prepared before the test were near the participant.
- Therapist asked the patient to take the weight from the ground, curl their forearm from the elbow and do curls in 30 secs as much as they could.
- Therapist was counting the curls with a chronometer.
- Number of curls was noted.

Lower Extremity Strength Assessment

Time up to go (TUG)

The test evaluates the dynamic balance in relation to the center of gravity. Also measure the sit-to-stand ability, walking and risk of falls for older adults. In this test, time is important. If the time exceeds 12 seconds, it means that the participant is at fall risk (19,20).

Online:

- The screen had been adjusted to follow the participant in a three-meter area.
- The chair with no arms was used.
- The participant measures the 3-meters distance.
- The chair was at the start point and the slipper was at the 3rd-meter point.
- Therapist demonstrated the test and the participant applied the test.
- The test time was determined by a chronometer and noted by the therapist.

Five times sit-to-stand test (FTSTS)

Five times sit-to-stand test is associated with lower extremity strength for the elderly. This test shows clinicians the relationship between static and dynamic balance and transitional movements for older adults (20,21).

Online:

- The screen was adjusted.
- The chair without arms was used.
- Therapist demonstrated the test.
- A chronometer was used to measure how many seconds it took to stand up and sit down at five times.
- The time elapsed while sitting and standing up five times was noted.

Balance Assessment

Berg Balance Scale (BBS)

The scale measures both static and dynamic balance with tasks. The 14 items in this scale measure the static sitting and standing balance. Normal performances are graded from 0 (the patient is unable to perform the task) to 4 points (normal performance) (22). In this study, a ruler and board pen were used for the evaluation of reaching forward with an outstretched arm while standing.

Online:

- The screen was adjusted.
- Two chairs were used (one of them had arms the other had no arms).
- Test was explained to the participant and their family member.
- Therapist demonstrated the all instructions before the participant applied.
- Family member helped with the measurement.
- During the evaluation, the therapist corrected the participant's posture verbally.
- All the instruction results were noted.

Flexibility Assessment

Toe touch test (TTT)

The Toe touch test is used to assess hamstring muscle flexibility. The therapist asks the participant to lean forward without bending the knees as far as s/he can on the step board. Step ground is accepted as ground (zero line). Measures are taken between the step ground and the participant's fingers (23). In this study, a ruler and board pen were used for distance measurement.

Online:

- The screen was adjusted.
- The test was explained to the participant and family member.
- A step board that the participant had was used.
- Therapist demonstrated the test.
- Therapist corrected the participant's posture verbally during the test.
- The top of the third finger of the participant was pointed with a board pen.
- The distance between the zero point and the top of the finger was measured by the family member.
- The distance was noted by therapist.

STATISTICAL ANALYSES

The IBM SPSS Statistics program was utilized to conduct the statistical analysis in this study. Wilcoxon test was used to analyze the differences between online and face-to-face groups. P-values above 0.05 showed no significant differences between the groups.

RESULTS

The participants' demographic features as age, BMI, MMSE and FES-1 values were given as mean and standard deviation in the table 1. The results of both online and face-to-face assessments were presented in the table 2. The results revealed that there were no statistically significant differences between the online and face-to-face assessments of the TUG ($p=0.057$), BBS ($p=0.546$) and TTT ($p=0.438$). However, the online FTSTS ($p=0.028$) and ACT ($p=0.002$) tests were significant differences compared to face-to-face evaluation.

Table 1: Descriptive statistics of demographic measurement		
	Mean	SD
Age	59.1	8.02
Height (cm)	165.3	7.82
Weight (kg)	71.8	15.28
BMI (kg/m ²)	26.18	4.55
MMSE	26.8	2.09
FES-1	19.8	4.29

(BMI: Body Mass Index, MMSE: Mini Mental State Examination, FES-1: Falls Efficacy Scale-1)

Table 2: Comparison of TUG, BBS, FTSTS, Arm Curl and Toe Touch tests of face-to-face and online assessments.				
	Face-to-face Assessment	Online Assessment		
	Mean±SD	Mean±SD	Z	p
TUG (sec)	10.55±2.92	11.75±3.08	-1.904	0.057
BBS	49.9±2.78	49.75±3.12	-0.604	0.546
FTSTS (sec)	17.14±4.98	18.89±4.80	-2.203	0.028
ACT	18.8±3.59	16.1±4.27	-3.168	0.002
TTT (cm)	-4.15±17.05	-4.85±14.97	-0.776	0.438

(TUG: Timed Up and Go, BBS: Berg Balance Scale, FTSTS: Five Times Sit to Stand, TTT: Toe Touch Test)

DISCUSSION

This study aimed to compare the online and face-to-face assessment of physical functions in healthy adults. The study found that there were no statistically significant differences between face-to-face evaluation and on the online platform for the TUG, BBS, and TTT assessments which are performed on the supervised online platform.

In the literature many studies show that the possibility of exercise prescription and following their efficiency on the online platform. However, there are very few studies on recent online assessment. Studies that are exercise prescription and following their efficiency did not report if the assessment of the physical functions was done on the online platform (7,24-26). One study performed a remote tele-assessment for patients with Multiple Sclerosis. In this study, researchers were testing balance (TUG and BBS) and also Hand-Grip Strength. While the findings of this study are consistent with the TUG and BBS results of our study, the opposite result was obtained for functional

exercise capacity (FTSTS). However, results of the studies validity and reliability have not tested yet (13). Besides, the Tele-rehabilitation was assessment of 30 seconds of sit-to-stand (30-s STS) test for people with type 2 diabetes. Face-to-face assessment and tele-assessment were done with WhatsApp application by different physiotherapists. This study revealed that although physiotherapists used different assessment methods, there was no difference between the results (27). In addition, Mani et al. showed that Tele-rehabilitation based assessments were valid and reliable for the neck pain intensity, active range of motion, deep neck flexor muscle endurance and disability with using computer program. They found that acceptable values for the validity and higher degree of reliability values for this study (10). In another study, face-to-face and Tele-rehabilitation online evaluations of people with low back pain were made by different therapists, and as a result, researchers explain that Tele-rehabilitation could be used for the people with minimal disability of low back pain (12). Tore et al. showed the telerehabilitation exercise program had great effect on patients with knee osteoarthritis. And the groups had been evaluated before the exercise program via Zoom Meetings for only 30 chair-stand test (CST). The results of the study, both groups mean scores increased in 30 CST. However, Tele-rehabilitation group showed statistically significant improvements of physical functions (28).

In our study, we observed statistically significant differences between the online and face-to-face evaluation scores of the FTSTS and Arm Curl. We noted that the Arm Curl and FTSTS test results may be impacted by internet speed. Internet issues may impact both fine and gross movements, as indicated by a recent study on Tele-rehabilitation (29). The patients might not have understood the directions when the researcher conducted the tests. For this reason, we consider that prior experience of online evaluations by therapists will be useful in solving the problems that may arise during the evaluation.

The most important difference of our study from other studies is that it was carried out at home and by the same physiotherapist. In addition, the study design is planned in such a way that everyone can easily implement it without a special technological arrangement. Tele-rehabilitation applications will be used more widely in the future, so we think it is important to determine the standards for the online use of all assessment methods. The current study has shown that can be performed to adults of the assessments of TUG, BBS and TTT tests on the supervised online platform.

DECLARATIONS

Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. The Yeditepe University Non-Interventional Clinical Research Ethics Committee approved the study (E.83321821-805.02.03-64, 19 October 2022).

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

Funding

No funding was received to assist with the preparation of this manuscript.

Conflict of Interest

The authors have no conflicts of interest to decelerate that are relevant to the content of this article.

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